UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH
Environmental Research Laboratories
1315 East West Highway
Silver Spring, Maryland 20910

DEC 18 1998

MEMORANDUM FOR: Daniel Albritton
Director, Aeronomy Laboratory

FROM: James L. Rasmussen
Director

SUBJECT: Aeronomy Laboratory Program Review

This is my summary letter regarding the September 1-3, 1998, Aeronomy Laboratory Review and includes as attachments the letters from the four external reviewers. It is pleasing, to say the least, to read the commendations and ranking given to the Aeronomy Laboratory (AL) science, scientists, and to you personally for your outstanding leadership and management of the enterprise. I wish to comment and expand on a few of the comments and suggestions by the reviews, and a few of them are certainly directed at ERL, and NOAA/OAR management - these I will cover at the end of the letter.

First, the reviews acknowledged the importance of the post-doc and visitor component of the Aeronomy Laboratory. Their concern regarding career path opportunities with both the Federal and CIRES structure reinforced our efforts to increase FTE allocations and to continue to work with CIRES to ensure that our cooperating scientists there are well taken care of. Your position treating the Laboratory and CIRES staff equally in the machinations and impacts brought about by budget problems perhaps was not clearly understood by the reviewers. I think you are handling it correctly.

Secondly, the reviewers concurrence in the shift from stratospheric ozone to tropospheric chemistry issues as the core Aeronomy Laboratory science thrust was encouraging. As I read the comments the reviewers felt emphasis should be on regional to

global scale issues - avoiding for the moment at least, moving into local scale phenomena and impacts on human health for example. In this regard, all reviewers applauded the concentration on development of new instruments and measurement techniques - and the utilization of aircraft as the platform to carry the instrumentation.

The move to the new building should afford an increasing opportunity to bridge between the atmospheric chemistry research efforts and the dynamical and physical meteorology research carried out in other Laboratories. In addition, the small Aeronomy Laboratory group devoted to the tropical profiler network and associated meteorological analysis must reach out to the ongoing work in the other Laboratories and this hopefully will be facilitated in the new building. This cooperation will alleviate the concern regarding possible overlap and duplication that we have discussed from time to time. Joint cooperative projects would be an ideal.

Two issues that are directed at all of us were raised. The first was the two edged sword in the form of the new building which will provide an environmental for expanded and accelerated research while at the same time potentially costing more for rent etc. and without increased budgets will have a negative impact on resources to do the research. I know you, as the chair of the Boulder Council for Laboratory Directors, are clearly aware of this and so are we. The fact that the reviewers raised the issue helps us in carrying the issue forward with more justification. We must articulate the problem to OAR, NOAA and DOC management and ultimately to Congress as a high and continuing priority. Secondly, the move to increasingly use aircraft as the principle platform for the air-chemistry instrumentation translate directly into a need for NOAA to provide adequate platforms and ensure their availability for research. The cooperation that Aeronomy has had with NASA and NCAR in utilizing their aircraft is commendable, but NOAA has to anticipate Aeronomy Laboratory's needs and requirements too. This will become an increasingly acute problem in the future. You should press the issue by requesting fund through the initiative process and through the aircraft allocation process.

Finally Dan, I wish to commend you and all of the Aeronomy Laboratory staff - both the federal employees and the CIRES staff for presenting the Aeronomy Laboratory in such an excellent review.

Attachments

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH
P.O. Box 3000 • Boulder, Colorado 80307-3000
Roland A. Madden • email: ram@ncar.ucar.edu
Telephone: (303) 497-1360 • Fax: (303) 497-1333

15 September, 1998

Dr. James Rasmussen
Director, Environmental Research laboratories
NOAA
1315 East-West Highway
SSMC 3
Silver Springs, MD 20910

Dear Jim:

It was a pleasure to serve on the Aeronomy Laboratory's Review Committee. The presentation by Dan Albritton and other scientists was well organized and very informative. Following are my comments.

The Aeronomy Laboratory (AL) constitutes a unique group of atmospheric chemists, instrument designers, and meteorologists within NOAA. Its research is relevant to NOAA Strategic Plan and contributes to goals of the scientific community in general. Its approach including field, theoretical, and laboratory experiments is a powerful one.

The AL is a world leader in increasing our understanding of stratospheric chemistry. Of special relevance is its studies of stratospheric ozone. Similarly, AL work on tropospheric chemistry is of vital importance for our efforts to maintain and improve air quality. The AL's ability to design and deploy instrumentation, take measurements, and to analyze and interpret them is of particular value in these endeavors.

Movement to the problem of "anomalous absorption" of radiation is a natural development. It is one that is very promising since it will bring to bear the background and knowledge of leading chemists who understand the basic physics of radiation.

Maintenance of the profiler network is an important service to the meteorological community. The presence in house of persons interested in using the resulting data, here I am thinking not only of data from the equatorial Pacific but that used in boundary layer studies, ensures data quality. Similarly I think it is a great advantage to have a contingent of meteorologists working on phenomena such as that of tropical waves that were described in the review. This contingent can provide links between all of the AL and the wider meteorological community.

Some Recommendations:

In listening to the chemists presentations it became clear to me that their data and analyses could be very helpful in interpreting normal meteorological data. Similarly, interpretation of chemical measurements can benefit from meteorological data. Meteorologists in

the AL have links to those in the Climate Diagnostics Center (CDC) and future collocation may result in collaborations between the chemists and meteorologists in the AL and the meteorologists in CDC.

The infusion of young postdocs and advanced graduate students supported by the Tropical Dynamics and Climate Program has been a good thing for the Boulder meteorological community and I recommend that it continue.

The Pacific Ocean profiler network should be maintained. Top priority should be for the profilers at locations where upper-air data would not otherwise be available. If we are to hope to learn new things we cannot depend solely on data provided by the large-scale analysis centers. The Pacific network is important for our efforts to understand the Intraseasonal Oscillation (MJO) and ENSO. Correspondingly, monitoring these data may help us in long-range and climate forecasting in the equatorial pacific and hopefully in midlatitudes too.

I judge management to be very effective and small in size. Future plans are appropriate and past successes point to future ones. My own opinion is that too much talent is occupied in "Assessments" (example relatively frequent IPCC reports). I strongly concur with the Director's objective of keeping participation in assessments and in "outreach" at the "10% level."

Sincerely,

Roland A. Madden

Roland A. Madden

Cc: Dr. Dan Albritton
Director, Aeronomy Laboratory
Environmental research Laboratories
325 Broadway
Boulder, Colorado 80303-3328

HAMPTON UNIVERSITY
HAMPTON, VIRGINIA 23668

DEPARTMENT OF PHYSICS
CENTER FOR ATMOSPHERIC SCIENCES
POST OFFICE BOX 6075

Dr. James L. Rasmussen, Director
NOAA Environmental Research Laboratories
1315 East West Highway
Silver Spring, MD 20910

Dear Jim,

Please find below my report for the Aeronomy Laboratory peer review, September 1-3, 1998.

It is abundantly clear to me that the Aeronomy Laboratory (AL) is among the highest quality laboratories in atmospheric sciences in the world today and, arguably, the finest in the U.S. Government. Their leader, Dan Albritton is an exemplary manager of this collection of very capable researchers. His leadership is manifested in everything that the laboratory produces or exudes, including his significant contributions to world assessments, e.g., ozone. He is exceedingly professional, considerate, articulate and capable. Dan recognizes that researchers "do" research, not facilities or managers, and he is visionary in the direction of the laboratory. It is clear that Dan and his senior researchers have carefully chosen a few areas on which to concentrate their resources and talent pool, creating a "minimum" critical mass in each area. Most government laboratories develop their "niche", in the context of the laboratory's broader mission statement, around their people and theoretical or experimental capabilities. The Aeronomy Laboratory historically has set their goals on broad science and policy needs. They have not tended to develop an instrument because they could, but because of the need for these data in their science context. In other words, they conduct atmospherically relevant experiments, whether in the laboratory or atmosphere. Further, the mix of theoretical, analytical, and experimental capabilities are carefully balanced and nurtured. It is also very clear that the AL works with a broad segment of the science community. The author lists for their publications strongly support this point. Also, the AL's philosophy of diversifying their staff with visiting scientists, undergraduate and graduate students and post doctoral visitors, appears to work very well in their favor. In addition, the arrangement with CIRES provides a much needed flexibility in a government research environment.

More specifically, the stratospheric ozone research is outstanding and deserving of accolades from the world community. This has included their work on NOSE, the subsequent international airborne campaigns, the solution to the ozone hole vis a vis heterogeneous chemistry, the key measurements and use of gas tracers to better understand processes, the leadership roles in these campaigns, the determination of key kinetic characterizations and, the hallmark of this group, total dedication for arriving at the "truth".

The tropospheric ozone work is also impressive with a strong capability of measurement and modeling, and theory. I was especially impressed with the ozone lidar. These data are unique to the global data record because of their time and space resolution over a multi-year period. The tie to a large dynamical system (ENSO) is impressive.

The aerosol research is also of a high level with new and unique data being obtained with the PALMS airborne instrument. Even though not quantitative, it provides a new "window" into aerosol properties and composition not previously determined. The consequences on growth and radiative effects are extremely important.

The newest field of research for the AL is in climate processes. The AL will bring a new (and needed) approach to this area, including an understanding of aerosols and gases and their radiative effects. I found the discussions of PFCs as potent greenhouse gases to be fascinating, which supports the potential for AL contributions in this area. Also, I thought the water vapor research is very important and was well presented.

The future is exceedingly bright for the AL and my recommendation is to "stay the course". The new building will be a well deserved addition to this outstanding laboratory and will create an even more collaborative atmosphere for other elements of the ERL.

Recommendations

- Continue the leadership role in international and national assessments. This represents a very important contribution to public outreach and, further, focuses the group in directing their energies / resource to relevant and timely research. Foster multi-issue assessments.
- Continue the mix of people within the AL. Visiting scientists and students bring new ideas and enhance capabilities. The female researchers highlighted in the review were very competent, as were the young presenters. Their recent new hires are very competent and this bodes well for the future.
- Continue the AL's excellent collegial activities, publications, and research. Their publication record with non-AL staff is commendable and wise.
- Articulate better their educational outreach program, which is important for developing the next generation of informed citizens and, perhaps, scientists.
- Continue and expand, if possible, their ozone lidar effort.

•Continue their aerosol characterization efforts with PALMS, and other techniques.

•Continue their balanced and focused research program of trying to understand the atmospheric processes to improve environmental prediction, and continue their approach of theory and modeling, laboratory investigations and field studies, with respect to stratospheric ozone, tropospheric or regional chemistry and climate processes.

It was a pleasure for me to take part in this year's AL external review. I hope my comments and recommendations are helpful for your needs.

Sincerely,

Dr. M. Patrick McCormick
Professor and Co-Director
Center for Atmospheric Sciences
Hampton University
Hampton, VA 23668

CC: Dr. Dan Albritton, Director
NOAA Aeronomy Laboratory
Mailcode R/E/AL
325 Broadway
Boulder, CO 80303

School of Environmental Sciences
University of East Anglia
Norwich NR4 7TJ, United Kingdom
Tel: 44 1603 592532
Fax: 44 1603 452420
Email: m.penkett@UEA.ac.uk

25 September 1998

Dr. James L. Rasmussen
Director
NOAA/OAR/Director, ERL
SSMC3, Rm 11618, Mailstop R
1315 East West Highway
Silver Spring, MD 20910-3282

Dear Dr Rasmussen,

NOAA Review

I very much enjoyed the opportunity to take part in the Review of the Aeronomy Laboratory. It was a very stimulating experience. As you are no doubt aware the Aeronomy Laboratory contains some of the most able atmospheric scientists in the world and the management is of the highest calibre. It therefore has a unique claim to be the best in the world in the studies of atmospheric chemical processes. The notes that follow are a formal recording of the verbal comments that I made in the reviewers' response session at the end of the review taking into account the points raised in the instructions to reviewers provided by ERL Management.

My first comment concerns the quality and effectiveness of the Aeronomy Laboratory Management. The Laboratory is managed by a person (Dr D. Albritton), who is well respected throughout the world community as a person who combines an excellent scientific understanding of many issues with a capacity to make first class decisions time after time. He is also a person who interacts extremely well with people of varying abilities and functions. It is a very difficult task to manage people of the capability of Susan Solomon, Ravishankara, Fred Fehsenfeld and Adrian Tuck without giving rise to internal jealousies, but Dan Albritton does it supremely well. He is aided in this enormously by the operating philosophy of the Laboratory, which is to ensure continuity of employment and be less concerned with short-term grant proposals. Succession may be an issue here in time, but not at present.

My second comment concerns the decision made by the Laboratory staff to move away from its previous core activity of stratospheric ozone research to issues more concerned with the troposphere. This includes studies related to climate where I am extremely pleased to see that the Aeronomy Laboratory will be adding its weight to that of others who believe that chemical phenomena in the troposphere are likely to have a dominant influence on changing weather patterns on a regional scale. An important issue here is to stress the need for comprehensive aircraft studies focusing on processes to supplement the large amount of data on spatial distribution of many trace species that will soon be available from satellites.

In line with this switch of emphasis, is the continuation of studies of regional pollution and its potential impact on pollution of the atmosphere on a global scale. This is related to climate research but also impacts on air quality. Within the USA, the group of tropospheric chemists who study regional air pollution at the Aeronomy Laboratory, are amongst the best. The depth of understanding produced by Aeronomy Laboratory researchers into complex issues, such as the relative contribution of natural and anthropogenic emissions to the overall production of regional pollution, has led to a completely different concept of how control measures should be introduced. It would be most unwise of the US Government to leave studies of regional air pollution purely to regulatory agencies such as the EPA who have a vested interest in proving that the control measures deployed based on their in-house understanding, are working.

The Aeronomy Laboratory specialises in the production of new instrumentation which gives enormous new insight into many problems associated with air pollution and global change. Instances of this new instrumentation include the capability now to measure the composition of aerosols in real time, and to study the gaseous organic content of the atmosphere in much more detail at higher time resolution. Presently these instruments are being used for more global type studies but they could equally be used to study aspects of air pollution concerned with human health. Even though the phenomenon of photochemical smog has been known since the 1950's the true agents which produce damage to health have never properly defined. The Aeronomy Laboratory may have the capability to do this but moves which involve studies of the effects of air pollution on human health could not be done independently and would of necessity need interaction with others with more medical knowledge. This would inevitably lead to conflicts over turf issues and could lead to a loss of effectiveness. I myself would advise that the Aeronomy Laboratory continue to specialise on issues on a regional to global scale. The use of platforms is an issue here and senior management must ensure that NOAA researchers have ready access to a range of aircraft.

Finally, I must convey to you how impressed I was with the quality of the younger members of the Laboratory who are making a huge contribution to the overall success of the Aeronomy Laboratory. These include people such as David Fahey, Michael Trainer, Dan Murphy and Dave Parrish. It is important that the Laboratory recognise the capabilities of these people and the need to ensure that there is obvious succession to some of the more senior people. The involvement of these people in issues other than pure

science is something to be considered with great care. It is necessary to expose them to international activities concerned with assessment etc. but care must be taken to ensure that this does not impede their scientific productivity when they are at their most active. The method of recruitment of young people is strongly aided by the link between NOAA and CIRES.

I have no doubt that the Aeronomy Laboratory has an outstanding future ahead of it in the new facility now being completed in Boulder. Providing they are not penalised financially for its occupancy they have the long-sought opportunity to interact even more closely, if that were possible. There are many unsolved problems in atmospheric environmental science that need steady and constant study by people of high intelligence which is a hallmark of Aeronomy Laboratory personnel. I have given some indications in my review of the way the Laboratory should proceed. In the end though the direction to be followed must be defined by the people most involved since they must pursue this with enthusiasm, and with confidence in the wisdom of their chosen course.

Yours sincerely,

Stuart A. Penkett

Georgia Institute of Technology
School of Chemistry and Biochemistry

September 14, 1998

Dr. James L. Rasmussen
Director, NOAA-OAR-ERL
1315 East-West Highway
Silver Spring, Maryland 20910

Dear Dr. Rasmussen:

Thank you for giving me the opportunity to participate in the external review of the Aeronomy Laboratory. Although I was already familiar with a significant fraction of their activities before becoming involved in the review, my visit to Boulder was very informative. The Aeronomy Laboratory (AL) is, indeed, an impressive organization. Their contributions to the field of atmospheric chemistry over the last decade rank at or near the top for any national laboratory or university in the world. The three senior scientists (Fehsenfeld, Ravishankara, and Solomon) are widely recognized as leaders in the field of atmospheric chemistry and each would appear on a (very) short list of the best researchers in the world in their own areas of specialization. Other members of the AL staff are well on the way to achieving similar recognition. In fact, it appears that one of the key issues facing management concerns career growth opportunities for talented, motivated junior staff members. Because of its location and reputation, the aeronomy lab has traditionally been able to attract the highest quality postdoctoral researchers. Susan Solomon pointed out during the review that many of the more senior staff members started their AL careers as postdocs. Maintaining a constant influx of quality postdocs is an excellent way to bring new ideas into the laboratory and to "audition" potential staff members. As long as high quality young people can be attracted, I encourage management to continue to make resources available for postdoctoral positions. Of course, a constant influx of postdoctoral researchers also helps to keep the average age below 40!

AL appears to be a well-managed organization. The number of staff members whose primary function is administration seems very small, and conversations I had with senior members of the research staff suggest that Dan Albritton does an excellent job of minimizing their administrative workload. Although it wasn't discussed at the review, I am aware that AL overhead costs are quite low, i.e., a large fraction of the total budget is spent on salaries, equipment, travel, . . . and a relatively small fraction on infrastructure. One "red flag" which was raised at the review concerns the move into the new building. The move has some clear advantages with respect to laboratory space and improved interaction between the various groups within AL as well as between AL and other NOAA laboratories. However, it also appears that indirect costs will increase significantly when the new building is occupied. Unless the laboratory budget increases, a negative impact on important research programs could result. I urge those involved in the budget process to make it a very high priority to address this issue.

School of Chemistry and Biochemistry
Atlanta, Georgia 30332-0400 U.S.A.
PHONE 404·894·4002
FAX 404·894·7539

The differences between Federal and CIRES employees was brought up at the review, but was not really explained satisfactorily. I assume that this staffing approach results from some federally imposed limitation on the number of civil servant positions within AL. Many of the younger staff and a few of the more senior staff are CIRES employees. It appears important to maintain similar career tracks for the two different types of employees, and to take steps to counter the perception (which seems to exist at the present time) that CIRES employees are "less permanent" than Federal employees.

One of the recommendations of the 1992 Review panel was that AL continue its supportive role in data evaluations and assessment activities, a recommendation which certainly appears to have been followed. I strongly recommend that emphasis on these types of activities continue. The AL staff have the expertise to make important contributions in this area and can use each other as "sounding boards" for developing the most well thought out evaluations possible. Because AL receives little support from the primary "customers" of assessments, i.e., scientific funding agencies, policy makers, and industry, their participation helps lend credibility to the finished products. Active participation in assessments also represents an important way of "broadening the horizons" of talented junior staff, and provides them an excellent outlet for gaining increased visibility within the atmospheric chemistry community. In addition to participation in data evaluation and assessment activities, AL appears to be making public outreach a higher priority than it has been in the past. Most scientists find public outreach activities difficult, if not distasteful. It appears that AL has a few staff members who are particularly good at bridging the science/public interface; they should be encouraged and provided the resources to pursue outreach activities. Overall, however, I believe that public outreach should remain a relatively minor AL activity compared to either scientific research or assessment/data evaluation.

According to information which was provided to the reviewers, AL personnel authored about 90 papers per year during the five year period 1993-1997. This is a statistic which different people may interpret in different ways. One interpretation which was put forth in discussions between the reviewers is that the AL publication rate is not very good because it represents less than one publication per staff person per year (assuming a total staff of 114). Personally, I do not subscribe to the above interpretation. First of all, only about half of the total staff have position titles which suggest that they could be expected to fulfill the role of senior author on research publications. Furthermore, a large fraction of AL publications are well above average in both quality of the results presented and impact on the field of atmospheric chemistry. The AL group whose research activities I am most familiar with is the Atmospheric Chemical Kinetics Group (ACKG) headed by Ravishankara. There is little question that they are currently the most productive group in the world doing laboratory research in atmospheric chemical kinetics and photochemistry; both the quality and quantity of their publications are outstanding. Evidence that ACKG research is highly regarded within not only the atmospheric chemistry community, but also the physical chemistry community, is provided by the fact that Ravishankara is receiving the Polanyi Medal this month at the 15th International Symposium on Gas Kinetics in Bilbao, Spain. This medal is given once every two years and recognizes accomplishments at the highest level in the field of gas phase kinetics and reaction dynamics.

As discussed at the review, a major strength of AL is in the area of instrument development. I strongly endorse continued focus in this area. Adaptation of the PALMS and CIMS instruments to aircraft platforms offers great potential. Efforts should continue to develop variations of the PALMS technique which facilitate quantification of the composition of single particles. As mentioned in my summary comments at the review, a major strength of the tropospheric chemistry group is their focus on measurement quality. Because the urban and regional air quality community tends to be driven by regulatory rather than scientific concerns, there is, in my opinion, insufficient attention paid to the accuracy of field data which form the basis for many important policy decisions. I believe that the Tropospheric Chemistry group can make a major contribution to research in urban and regional air quality by pushing to establish a culture where more attention is paid to measurement quality.

The future of the Aeronomy Laboratory looks bright. The recent research initiative on climate processes has already paid dividends, and it appears that application of PALMS and Susan Solomon's spectroscopic techniques to climate forcing issues will pay big dividends over the next several years. Provided that issues regarding the added costs associated with occupying the new building are resolved, available resources seem adequate to allow all current initiatives to continue, and to keep AL at the forefront of the field of Atmospheric Chemistry over the next five years.

If you have any questions, I can be reached by telephone at (404) 894-3425 or by e-mail at pw7@prism.gatech.edu.

Yours Truly,

Paul Wine

Paul H. Wine
Professor, Schools of Chemistry & Biochemistry and Earth & Atmospheric Sciences

PHW:jcf

Enclosure

cc: Dr. Dan Albritton